

# Design and Analysis Tools for 4D Green Trajectories in Terminal and Transition Airspaces, Phase I

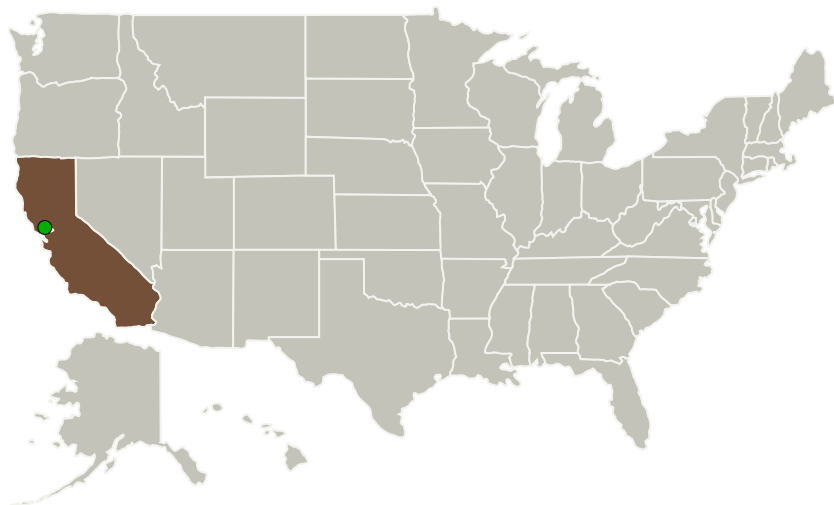
Completed Technology Project (2011 - 2011)



## Project Introduction

NASA has been involved in developing advanced automation systems for improving the efficiency of air-traffic operations, reducing controller workload and enhancing the safety in the national airspace system. In the past decade there has been emphasis on designing environmentally friendly operations that reduce fuel consumption, emission and noise as well. The objective of the proposed research is to develop a framework suitable for the design and analysis of 4D trajectories for terminal and transitional airspaces targeted for far-term implementation. The novel aspect of the proposed research addresses efficiency, throughput, and safety all in a combined and integrated manner. Advanced optimization algorithms will be used in the design of these trajectories. Research will also establish the feasibility of tracking these trajectories using 4D guidance algorithms. Analysis will be done to study the tradeoff between fuel consumption and the time of arrival. Phase I research will demonstrate the 4D trajectory synthesis and 4D guidance algorithm using realistic commercial aviation aircraft models. Phase II research will develop the tools to a level that can be used by NASA researchers in the development of NextGen concepts.

## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Optimal Synthesis, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Los Altos, California
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

## Primary U.S. Work Locations

California

## Project Transitions

**February 2011:** Project Start**September 2011:** Closed out**Closeout Summary:** Design and Analysis Tools for 4D Green Trajectories in Terminal and Transition Airspaces, Phase I Project Image**Closeout Documentation:**

- Final Summary Chart Image(<https://techport.nasa.gov/file/138080>)

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

Optimal Synthesis, Inc.

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

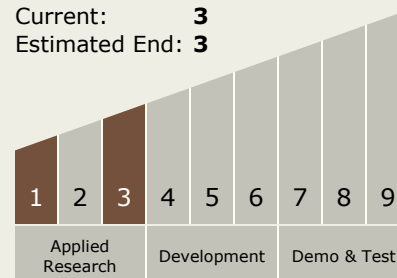
Carlos Torrez

**Principal Investigator:**

Veera V Vaddi

## Technology Maturity (TRL)

Start: **1**  
 Current: **3**  
 Estimated End: **3**



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## Technology Areas

### Primary:

- TX15 Flight Vehicle Systems
  - └ TX15.2 Flight Mechanics
    - └ TX15.2.1 Trajectory Design and Analysis

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System